

Sertifikaat



REPUBLIEK VAN SUID AFRIKA

PATENT KANTOOR
DEPARTEMENT VAN HANDEL
EN NYWERHEID

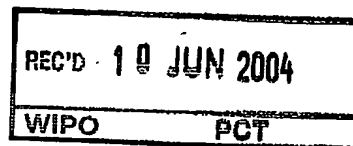
Certificate

REPUBLIC OF SOUTH AFRICA

PATENT OFFICE
DEPARTMENT OF TRADE AND
INDUSTRY

Hiermee word gesertifiseer dat
This is to certify that

EP 04/03666



the documents annexed hereto are true copies of:

Application forms P.1 and P.2, provisional specification and drawings of South African Patent Application No. 2003/2684 as originally filed in the Republic of South Africa on 7 April 2003 in the name of SUNTKEN ARTUR WILHELM for an invention entitled: "DIGITAL SENSOR".

Geteken te
Signed at **PRETORIA**

in die Republiek van Suid-Afrika, hierdie
in the Republic of South Africa, this

dag van
4th April 2004
day of

Registrar of Patents

**PRIORITY
DOCUMENT**
SUBMITTED OR TRANSMITTED IN
COMPLIANCE WITH RULE 17.1(a) OR (b)

BEST AVAILABLE COPY

REPUBLIC OF SOUTH AFRICA

FORM P2

PATENTS ACT, 1978

REGISTER OF PATENTS

OFFICIAL APPLICATION NO.		LODGING DATE: PROVISIONAL		ACCEPTANCE DATE	
1	01	22	7 Apr 2003	47	
INTERNATIONAL CLASSIFICATION		LODGING DATE: COMPLETE		GRANTED DATE	
1		23			
INTERNATIONAL APPLICATION NO.		LODGING DATE: INTERNATIONAL			
ALL NAME(S) OF APPLICANT(S)/PATENTEE(S)					
SUNTKEN, Artur, Wilhelm					
APPLICANTS SUBSTITUTED:				DATE REGISTERED	
SIGNEE(S)				DATE REGISTERED	
ALL NAME(S) OF INVENTOR(S)					
SUNTKEN, Artur, Wilhelm					
PRIORITY CLAIMED		COUNTRY	NUMBER	DATE	
3 - Use International abbreviation for country (see Schedule 4)		33	31	32	
TITLE OF INVENTION					
DIGITAL SENSOR					
ADDRESS OF APPLICANT(S)/PATENTEE(S)					
554 WITOGIE STREET, THE WILLOWS, PRETORIA, RSA					
ADDRESS FOR SERVICE				REF	
HAHN & HAHN INC, PRETORIA					
TENT OF ADDITION NO.		DATE OF ANY CHANGE			
ESH APPLICATION BASED ON		DATE OF ANY CHANGE			

REPUBLIC OF SOUTH AFRICA
PATENTS ACT, 1978

APPLICATION FOR A PATENT AND ACKNOWLEDGEMENT OF RECEIPT
[Section 30 (1) - Regulation 22]

FORM P1

Revenue stamps or revenue franking machine impression
Official date stamp

The grant of a patent is hereby requested by the undermentioned applicant on the basis of the present application filed in duplicate

OFFICIAL APPLICATION NO.
21 01 2003/2684

(i) APPLICANT'S OR AGENT'S REFERENCE

(ii) FULL NAME(S) OF APPLICANT(S)
71 SUNTKEN, Artur, Wilhelm

(iii) ADDRESS(ES) OF APPLICANT(S)
554 WITOGIE STREET, THE WILLOWS, PRETORIA, RSA

(iv) TITLE OF INVENTION
54 DIGITAL SENSOR

(v) The applicant claims priority as set out on the accompanying form P2.
The earliest priority claimed is Country: Number: Date:

(vi) This application is for a patent of addition to Patent Application No. 21 01

(vii) This application is a fresh application in terms of section 37 and is based on Patent Application No. 21 01

(viii) This application is accompanied by:

X	1. A single copy of a provisional specification of 6 pages.
X	2. Drawings of 4 sheets
	3. Publication particulars and abstract (form P8 in duplicate).
	4. A copy of Figure of the drawings for the abstract.
	5. An assignment of invention.
	6. Certified priority document(s) (state number):
	7. Translation of the priority document(s).
	8. An assignment of priority rights.
	9. A copy of the form P2 and the specification of SA Patent Application No.
X	10. A declaration and power of attorney form P3.
	11. Request for ante-dating on form P4.
	12. Request for classification on form P9.
	13. In terms of section 31(1) the applicant has added additional revenue stamps to this form for claiming priority after 12 months but before 15 months from the priority filing date.
X	14. Form P2 + copy

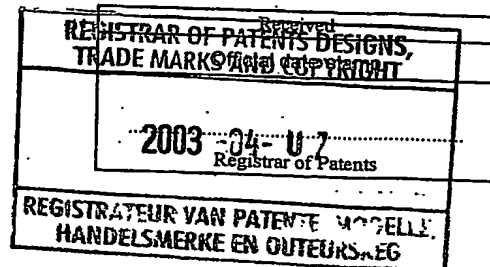
21 01

(ix) 74 Address for service: HAHN & HAHN INC, 222 Richard Street, HATFIELD, 0083, Pretoria

Dated this 7 day of April 2003

Michael
Signature of applicant(s) or agent

This duplicate will be returned to the applicant's address for service as proof of lodging but is not valid unless endorsed with an official stamp



REPUBLIC OF SOUTH AFRICA
PATENTS ACT, 1978
PROVISIONAL SPECIFICATION
[Section 30(1) - Regulation 27]

OFFICIAL APPLICATION NO

21 01 *2003/2684

LODGING DATE

22 7 Apr 2003

FULL NAME(S) OF APPLICANT(S)

71 SUNTKEN, Artur, Wilhelm

FULL NAME(S) OF INVENTOR(S)

72 SUNTKEN, Artur, Wilhelm

TITLE OF INVENTION

54 DIGITAL SENSOR

DIGITAL SENSOR**FIELD OF THE INVENTION**

5

This invention relates, in general, to the field of digital sensors and, in particular, to the field of digital passive infra-red (PIR) sensors.

BACKGROUND TO THE INVENTION

10

Passive infra-red (PIR) sensors are typically, but not exclusively, used to detect the presence of humans in a particular zone. PIR sensors find ready application in the fields of sensor lights, intruder detectors, and occupation detectors (used, for example, to switch and/or regulate lighting and/or air-conditioning systems in hotels, offices, and the like so as to conserve energy).

15

The Inventor is aware of conventional PIR sensors which typically include a conventional analogue PIR element connected, via a capacitive node having a high impedance, to an impedance converter for converting the high impedance to a relatively low impedance on the output of the sensor without amplification. Accordingly, an analogue signal is available at the output of the conventional PIR sensor.

20

SUMMARY OF THE INVENTION

25

According to the invention there is provided a digital sensor which includes

- an analogue passive infra-red (PIR) element; and

- an analogue to digital converter (ADC) connected to the output of the analogue PIR element so as to provide a digital output.

30

The PIR element is typically a conventional PIR element.

The ADC may include an input amplifier.

The ADC may include an input means configured to interface with the PIR element.

5 The sensor may include a decimation filter connected to an output of the ADC for filtering out unwanted high frequency components of the output of the ADC and providing a high resolution output.

10 The digital sensor may include a serial interface for converting a parallel output of the decimation filter to a serial output. This allows the output of the digital sensor to be available on a single pin.

15 The digital sensor typically includes control means for controlling the operation of the ADC, the decimation filter, and the serial interface.

The ADC, the decimation filter, the serial interface, and/or the control means are typically provided as an integrated circuit (IC).

20 The digital sensor is typically housed within a housing so that it can be used for direct connection to an external processor in a system incorporating the digital sensor.

DETAILED DESCRIPTION OF THE INVENTION

25 The invention will now be described, by way of non-limiting example, with reference to the accompanying drawings wherein:

Figure 1 shows, schematically, a block diagram of a conventional analogue passive infra-red (PIR) sensor;

30 Figure 2 shows, schematically, a block diagram of a digital sensor, in accordance with the invention;

Figure 3 shows, schematically, a more detailed block diagram of the analogue to digital converter (ADC) shown in Figure 2; and

Figure 4 shows, schematically, a PIR element connected to an integrated circuit (IC) including the rest of the features of the digital sensor.

In Figure 1 reference numeral 10 generally indicates a conventional analogue passive infra-red (PIR) sensor. The conventional sensor 10 includes a conventional analogue PIR element 12 connected, via a capacitive node 14 having a high impedance, to an impedance converter 16 for converting the high impedance to a relatively low impedance on the output of the conventional sensor 10 without amplification. Accordingly, an analogue signal is available at the output of the conventional sensor 10.

In Figures 2 and 4 reference numeral 20 generally indicates a digital sensor in accordance with the invention. The digital sensor 20 includes a conventional analogue passive infra-red (PIR) element 12 and an analogue to digital converter (ADC) 22 connected to the output of the analogue PIR element 12 so as to provide a digital output. The ADC 22 typically also includes an input amplifier.

As shown in Figure 3, in particular, the ADC 22 includes an input means configured to interface with the PIR element 12. Accordingly, the ADC 22 includes an integrator 24 which feeds in series into a comparator 26 which in turn feeds in series into a digital feedback means 28. The output of the digital feedback means 28 is fed back via a digital to analogue converter (DAC) 30 and the appropriate interfacing circuitry (not shown) into a summing node 32 together with the output of the PIR element 12. In this example, the PIR element 12 behaves like a piezo element and typically has a capacitance of approximately 20 pF to 60 pF. The output of the DAC 30 is also capacitive. The output of the summing node 32 is fed into the integrator 24 to complete the circuit.

In use, the ADC 22 operates by attempting to maintain the input of the integrator 24 at an average of zero by the digital feedback means 28 via the DAC 30 so as to compensate (neutralise) the output of the PIR element 12. The digital feedback means employs a special algorithm to achieve overall stability of this configuration.

The digital output of the digital feedback means 28 (which is in fact the digital output of the ADC 22) is fed into a decimation filter 34 for filtering out unwanted high frequency components and providing a high resolution output. In this example, the decimation filter 34 generates a 16 bit digital signal with a sampling rate of approximately 1 kHz. The bandwidth of this signal is limited to frequencies below 20 Hz.

The amplitude value of the output of the decimation filter 34 is then fed into a serial interface 36 for conversion into a serial output. This allows the output of the digital sensor 20 to be available on a single pin. The serial interface 36 also operates as a data latch.

The digital sensor 20 typically includes control means 38 for controlling the operation of the ADC 22, the decimation filter 34, and the serial interface 36. An oscillator 40 is connected to the control means 38 to provide a clock. The ADC 22, the decimation filter 34, the serial interface 36, and the oscillator 40 are typically provided as an integrated circuit (IC) 42, as shown in particular in Figure 4, and the entire digital sensor 20 is housed within a housing (not shown) so that it can be used for direct connection to an external processor (not shown) in a system incorporating the digital sensor 20 in a simple and user-friendly manner.

In this example, the serial interface 36 is in the form of a one bit serial interface which places very little load on the external processor and, accordingly, allows for multiple digital sensors 20 to be controlled by a single low speed external processor in a system. The external processor determines the frequency at which the data is read and, due to the low cut-off frequency and the order of the decimation filter, the external processor can read the data at rates as low as 100 Hz. A data bit is sampled after a 0 – 1 – high impedance sequence generated by the external processor.


It is to be appreciated that the invention is not limited to the precise constructional details as described above and shown in the drawings as other

variations incorporating the gist of the invention are possible and fall within the scope of the invention.

5 The Inventor believes that this invention has the advantage that an external digital signal processor of a system incorporating one or more digital sensors according to the invention can be connected directly to such digital sensor obviating the need to develop any analogue signal processing or any analogue to digital conversion.

10 Furthermore, the digital sensor does not require a very clean supply voltage VDD and is inherently protected against radio frequency (RF) disturbances. The additional cost of providing a digital sensor compared to that of a conventional analogue sensor is relatively small. Accordingly, multi-sensor applications are very cost effective.

15 DATED THIS 7TH DAY OF APRIL 2003.



20
HAHN & HAHN INC.
AGENT FOR APPLICANT

2003/2684

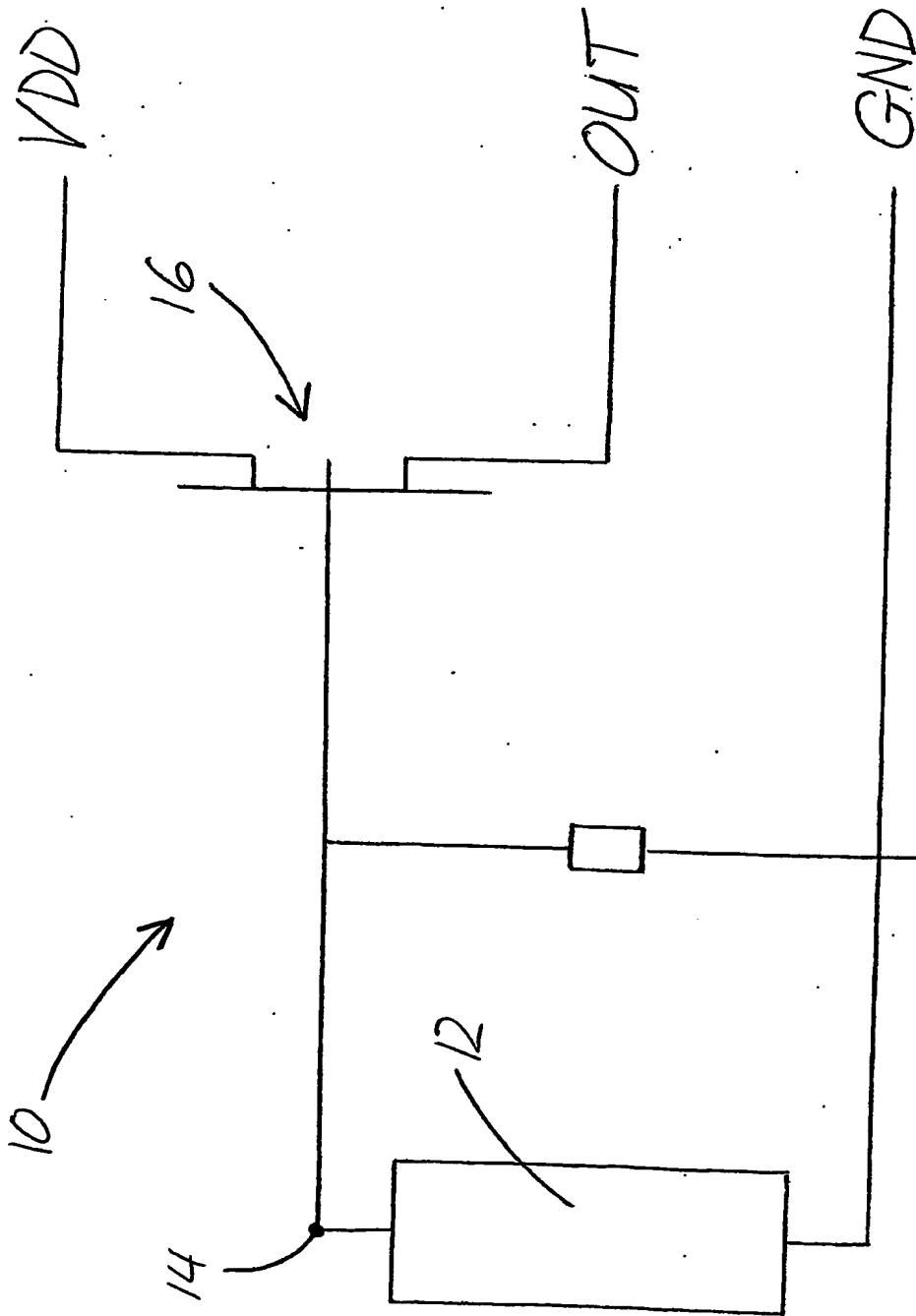


Figure 1

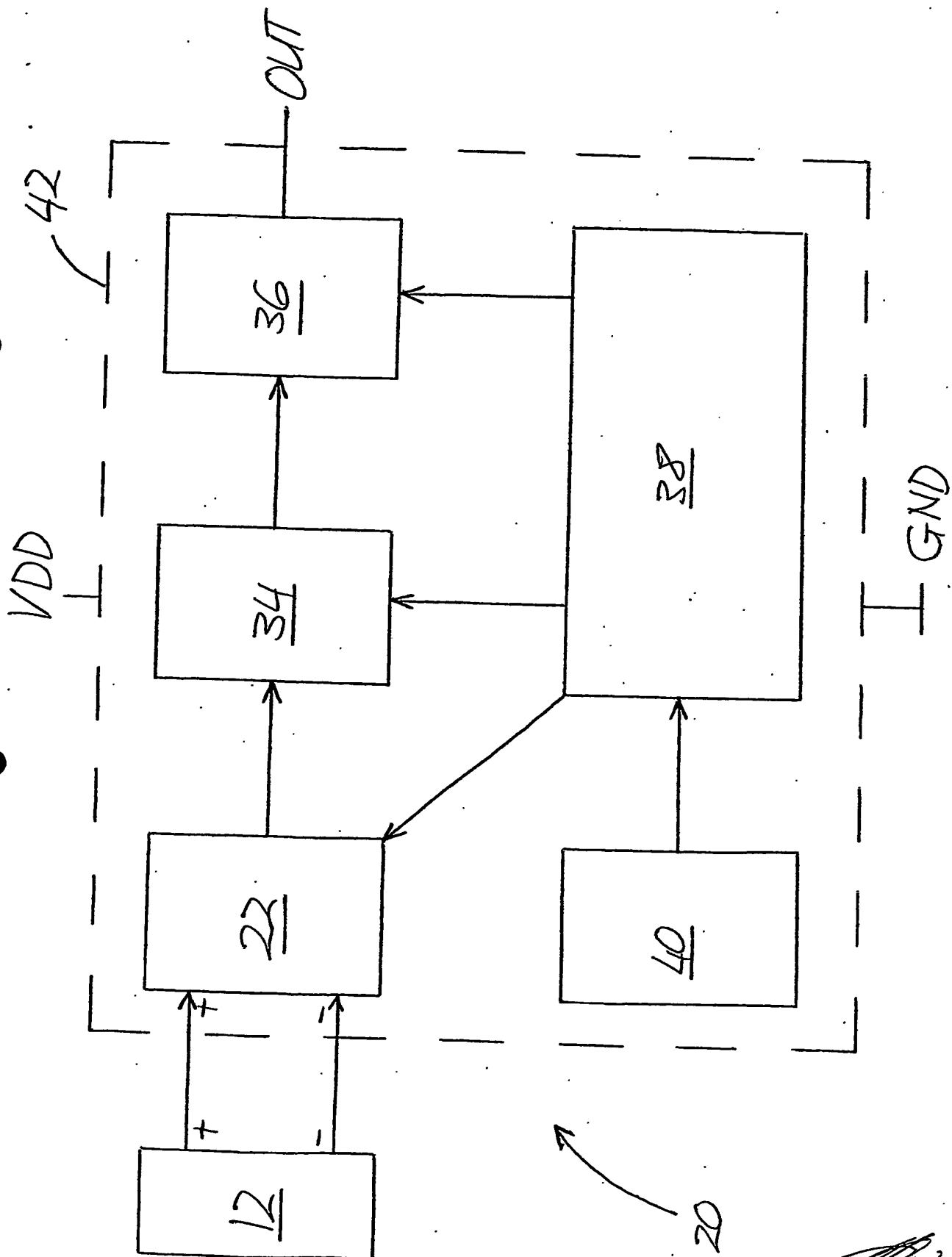


Figure 2

2003/2684

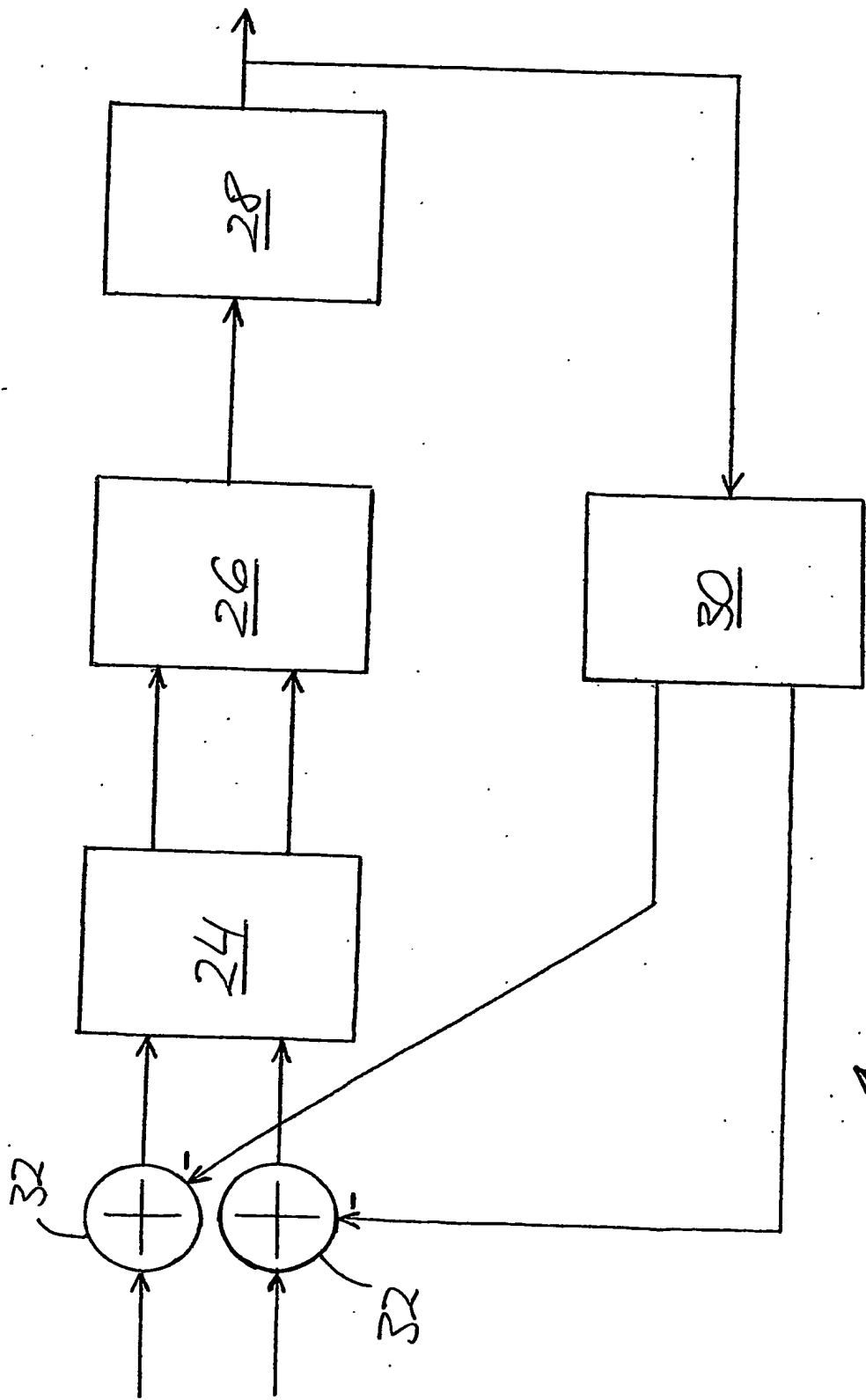


Figure 3

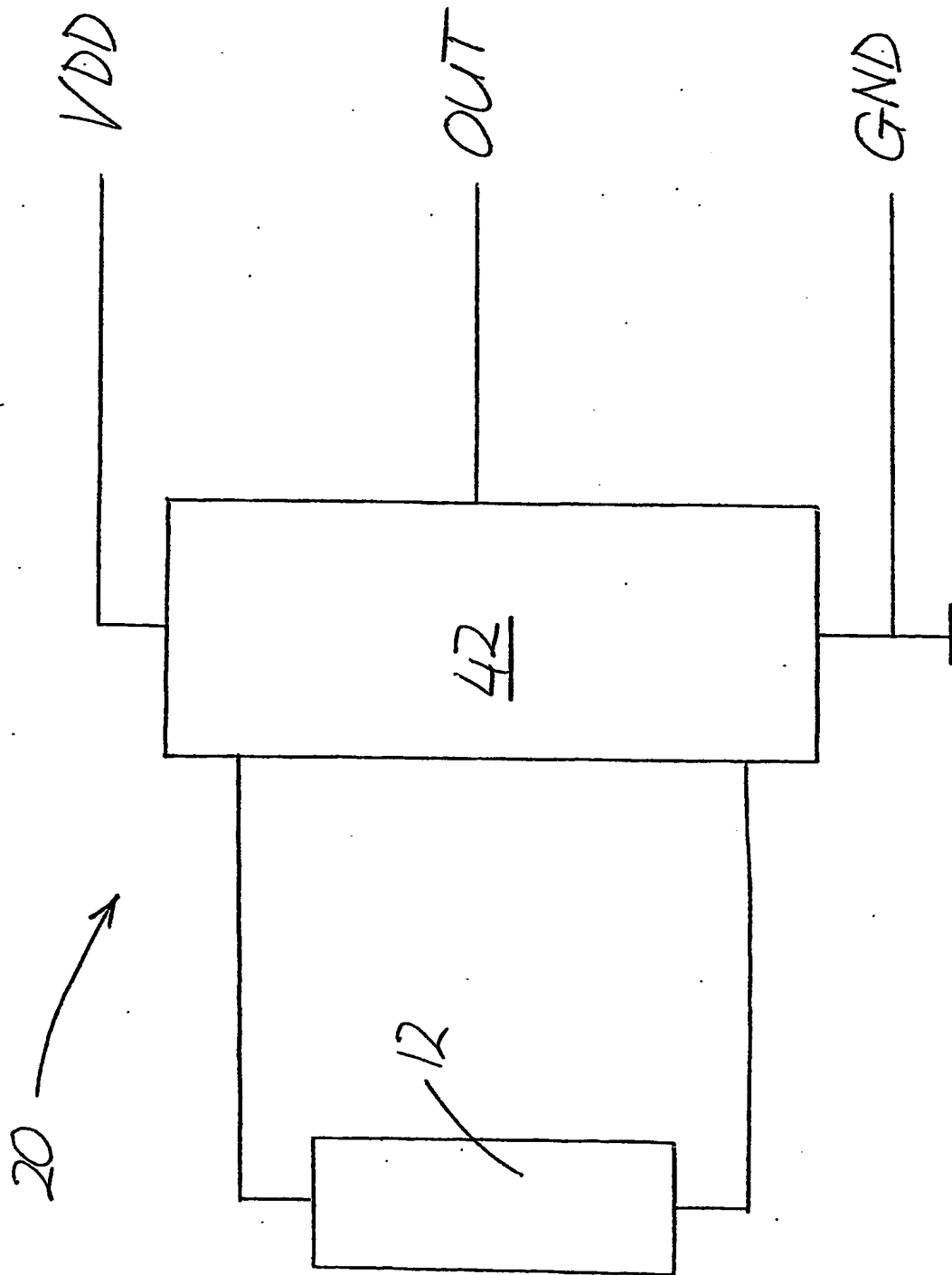


Figure 4

This Page is inserted by IFW Indexing and Scanning
Operations and is not part of the Official Record

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☒ BLACK BORDERS
- ☒ IMAGE CUT OFF AT TOP, BOTTOM OR SIDES
- ☒ FADED TEXT OR DRAWING
- ☐ BLURED OR ILLEGIBLE TEXT OR DRAWING
- ☐ SKEWED/SLANTED IMAGES
- ☒ COLORED OR BLACK AND WHITE PHOTOGRAPHS
- ☐ GRAY SCALE DOCUMENTS
- ☐ LINES OR MARKS ON ORIGINAL DOCUMENT
- ☐ REPERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY
- ☐ OTHER: _____

IMAGES ARE BEST AVAILABLE COPY.

**As rescanning documents *will not* correct images
problems checked, please do not report the
problems to the IFW Image Problem Mailbox**